F O C U S 2

A SENIOR TWO M A T H E M A T I C S

WORK BOOK

FOR NEW LOWER SECONDARY SCHOOL CURRICULUM

First edition

Ssebagala Muhammadi

Printed by

JESCHO

PUBLISHING HOUSE

Kampala (U), E.A.

F O C U S 2

A SENIOR TWO MATHEMATICS

WORK BOOK

1ST edition

Email: ssebagalam@gmail.com

Tel +256704762580

PREFACE

All, praise, honor and glory go to the Almighty Allah. The giver of all for enabling me to come up with this wonderful work.

Mathematics is a subject that cannot be learned only by memory. Learners must be active, creative and with a positive attitude without fearing to explore new things.

The book has been written strictly in conformity with the new Mathematics secondary school syllabus. There are a number of assignments and activity of integration for every topic.

MAPPINGS AND RELATIONS

A relation is the way in which two or more things are connected.
An arrow diagram is used to represent a relation between two mathematical sets.

ASSIGNMENT1

1. Given the set $A = \{5,6,7\}$ and set $B = \{25,36,49\}$.
Draw a diagram to illustrate the relation is "a square of" between set A and B.

2. Given a set $D = \{4,9,16,25\}$ and set $E = \{2,3,4,5\}$,state the relation between the two sets.

3. Draw an arrow diagram to show the relation defined by the following sets.

a) $A = \{4,5,6,7,8\}$ and $B = \{2,3,10,15,16,2514,21\}$;is "a factor of"

b) $M = \{4,5,8,11,12,15\}$ and $B = \{7,610,13,14,17\}$;is "two less than"

4. Shakib is a brother to Janat, Rahma and Fahimah.Usng the relation "is a brother to", draw an arrow diagram relating Shakib to his three sisters the relation a function? Justify.

5. Find the range for the following domains.

a) $\{-3,-2,-1,0,1,2,3,4\}$ using the function $x+2$

b) $\{-5,-3,0,2,4,6,7\}$ using the function $2x-1$

6.Determine whether the following relations are functions, give reasons

$\{(-2,4),(-1,1),(0,0)(1,1)(2,4)(3,9)\}$

ASSIGNMENT2

1. Given that $f(x)=2^x-5x$,find the range corresponding to the domain $\{0,1,2,3,4,5,6\}$.

2.Given a function $f(x) = x + 2$
Find the following ;

(i) $f(0)$ (ii) $f(1)$

(iii) $f(-2)$ (iv) $f(3)$

3.Given that $f(x) = x^3 - 3x^2 + 9x + 20$, find ;

(i) $f(-1)$ (ii) $f(-2)$

4.Given that $f(x) = x^2 + 1$, find the range for the domain$\{-2, -1, 0, 1, 2, 3\}$.

5.Given that $f(x) = 2x + 7$ and $g(x) = x^2 - 1$,find $3f(-1) - 4f(7)$.

6.Given that $L(x) = 3x - 2$, find the value of

(i) $L(-3)$

(ii) x when $L(x) = 10$. .

7.If $f(x) = (3)^x$, find f(4)

8.Given that $f(x) = 3^{x+2}$,find $f(-5)$

9.Given that $f(x) = \dfrac{2b}{x+1}$ and $f(5) = 3$. Find the value of b.

10.Given that $f(x) = 8x^2 + 5$, find the values of x for which $f(x) = 293$.

11.Given that $f(x) = \dfrac{x^2}{3} + 5$ Find x for which $f(x) = 17$

12.For the mapping $x \to 7 - 2x$, find the domain corresponding to the range $\{17,15,13,11,7,5\}$

Sample Activity of integration.

The table below shows marks scored by students in four tests marked out of 20 .

	Test1	Test2	Test3
Kayijja	20	17	15
Kayima	16	14	18
Kamara	10	13	19
Kagiri	05	08	14
Kabali	09	11	16

a)Draw three arrow diagrams relating the students to their marks obtained in each test.

b)Identify student whose performance improved in the three tests.

c)What student detoriated in performance from the first test to the last test.

VECTORS AND TRANSLATIONS

A vector is any quantity which has both magnitude and direction.ie a translation

A position vector is a vector with reference from the origin.

A displacement vector is the vector between two points.

A translation is a movement in a straight line.

Example1

Given vectors $a = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$, $b = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$ and $c = \begin{pmatrix} 6 \\ -2 \end{pmatrix}$

Find:

(i) $a + b + c$ (ii) $a - b - c$

Solution

(i) $\begin{pmatrix} -2 \\ 1 \end{pmatrix} + \begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 6 \\ -2 \end{pmatrix} = \begin{pmatrix} -2+3+6 \\ 1+7+-2 \end{pmatrix} = \begin{pmatrix} 7 \\ 6 \end{pmatrix}$

(ii) $\begin{pmatrix} -2 \\ 1 \end{pmatrix} - \begin{pmatrix} 3 \\ 7 \end{pmatrix} - \begin{pmatrix} 6 \\ -2 \end{pmatrix} = \begin{pmatrix} -2-3-6 \\ 1-7-^{-}2 \end{pmatrix} = \begin{pmatrix} -11 \\ -4 \end{pmatrix}$

Example2

Given vectors $p = \begin{pmatrix} -7 \\ 2 \end{pmatrix}$, $q = \begin{pmatrix} 2 \\ 8 \end{pmatrix}$ and $r = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$.

Find $2p + q - r$

Solution;

$2\begin{pmatrix} -7 \\ 2 \end{pmatrix} + \begin{pmatrix} 2 \\ 8 \end{pmatrix} + \begin{pmatrix} 1 \\ -3 \end{pmatrix} = \begin{pmatrix} 2\times -7 \\ 2\times 2 \end{pmatrix} + \begin{pmatrix} 2+3 \\ 8+-3 \end{pmatrix} = \begin{pmatrix} -14+5 \\ 4+5 \end{pmatrix} = \begin{pmatrix} -9 \\ 9 \end{pmatrix}$

ASSIGNMENT2

1.Work out the following:

a) $\begin{pmatrix}2\\7\end{pmatrix}+\begin{pmatrix}7\\3\end{pmatrix}$

b) $\begin{pmatrix}-1\\3\end{pmatrix}+\begin{pmatrix}2\\3\end{pmatrix}+\begin{pmatrix}-8\\9\end{pmatrix}$

c) $\begin{pmatrix}-5\\8\end{pmatrix}+\begin{pmatrix}-1\\3\end{pmatrix}+\begin{pmatrix}-6\\7\end{pmatrix}$

2.Given vectors: $a=\begin{pmatrix}3\\4\end{pmatrix}$, $b=\begin{pmatrix}2\\-1\end{pmatrix}$ and $c=\begin{pmatrix}1\\2\end{pmatrix}$

Work out.

(i) $3a-2b+7c$

(ii) $3(a+b-3c)$

3.Write down the translations and the coordinates obtained after the given translation.

a) $P(-5,3)$,4units forward and 5 units upwards.

b) $Q(4,3)$, 7units to the left and 3 units downwards.

c) $A(6,-3)$,6units backwards and 8 downwards.

d) $B(9,-1)$,2 units to the right and 5 units upwards.

4.Given that $OA = \begin{pmatrix} -8 \\ 7 \end{pmatrix}$ and $OB = \begin{pmatrix} -3 \\ -5 \end{pmatrix}$,find $|BA|$

5.Given coordinates $A(0,-1)$ and $B(-6,7)$,find $|AB|$.

6.A point $A(5,-8)$ is transformed to $A^1(3,-5)$.

(i)Find the translation vector T that maps A to A^1.

(ii)Given that $B^1(2,-6)$ is the image of B under the same translation. Find the coordinates of B

7.Given that $B^1(7,8)$ is the image of a point $B(2,4)$ after a translation. Find the translation vector.

8.A triangle ABC with vertices $A(0,2), B(2,-3)$ and $C(-2,1)$ is given a translation $T = \begin{pmatrix} 4 \\ 7 \end{pmatrix}$ to form triangle $A^1B^1C^1$.Determine the coordinates of $A^1B^1C^1$.

9.Given that $a = \begin{pmatrix} 4 \\ -5 \end{pmatrix}$ and $b = 3a$,find $|a + b|$

10.The coordinates of points A and B are (-5,-3) and (1,9) respectively. Find the:

a)the midpoint of AB

b) length of AB

11.Find the image of a rectangle ABCD with vertices A(1,1),B(4,1),C(4,3) and D(1,3) after a translation $T = \begin{pmatrix} 5 \\ 6 \end{pmatrix}$.

12.A pentagon ABCDE with vertices A(-3,2),B(-2,4),C(1,3),D(2,1) and E(-1,-1) is given a translation $T = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$ to form A^1,B^1,C^1,D^1 and E^1.Determine the coordinates A^1,B^1,C^1,D^1 and E^1.

13. The rectangle $ABCD$ with vertices $A(-1,2), B(2,2), C(2,1)$ and $D(-1,1)$ is mapped onto the mage $A^1B^1C^1D^1$ by a translation. If the coordinates of C^1 are $(5,3)$ .Find:
a)the column vector of the translation.
b)the coordinates of A^1, B^1 and D^1.

Sample Examination Question2

A spider is traced flying from Kasokoso at $A(20,30)$ to Kireka at a point $B(30,50)$ and finally to Banda at a point $C(50,80)$.
As an s.2 student and using your knowledge of vectors:

a)Identify the position vectors of points A, B, C and D.

b) Determine the distance between points A and C .

Sample Activity of Integration

Bagada travelled $600\,km$ due North from town P to town Q .He then travelled $800\,km$ due East from town Q to town R .

a)Using vectors and translation, how many kilometers would Bagada cover if he had travelled directly from town P to R.

b)If the engine consumes fuel worth $sh1500$ per kilometer, assist Bagada to calculate the extra fuel to cover the unusual distance to safely reach town R .

GRAPHS

ASSIGNMENT3.

1. Draw a table of values for the relation $Q = 7m - 5$ starting with $m = 2$ up to $m = 5$.

2. Given a relation $Z = 3x - 9$ and values of x as 1,3,5,7,9,11 .Draw the table for the values of Z and x.

3.Copy and complete the table below using a given relation

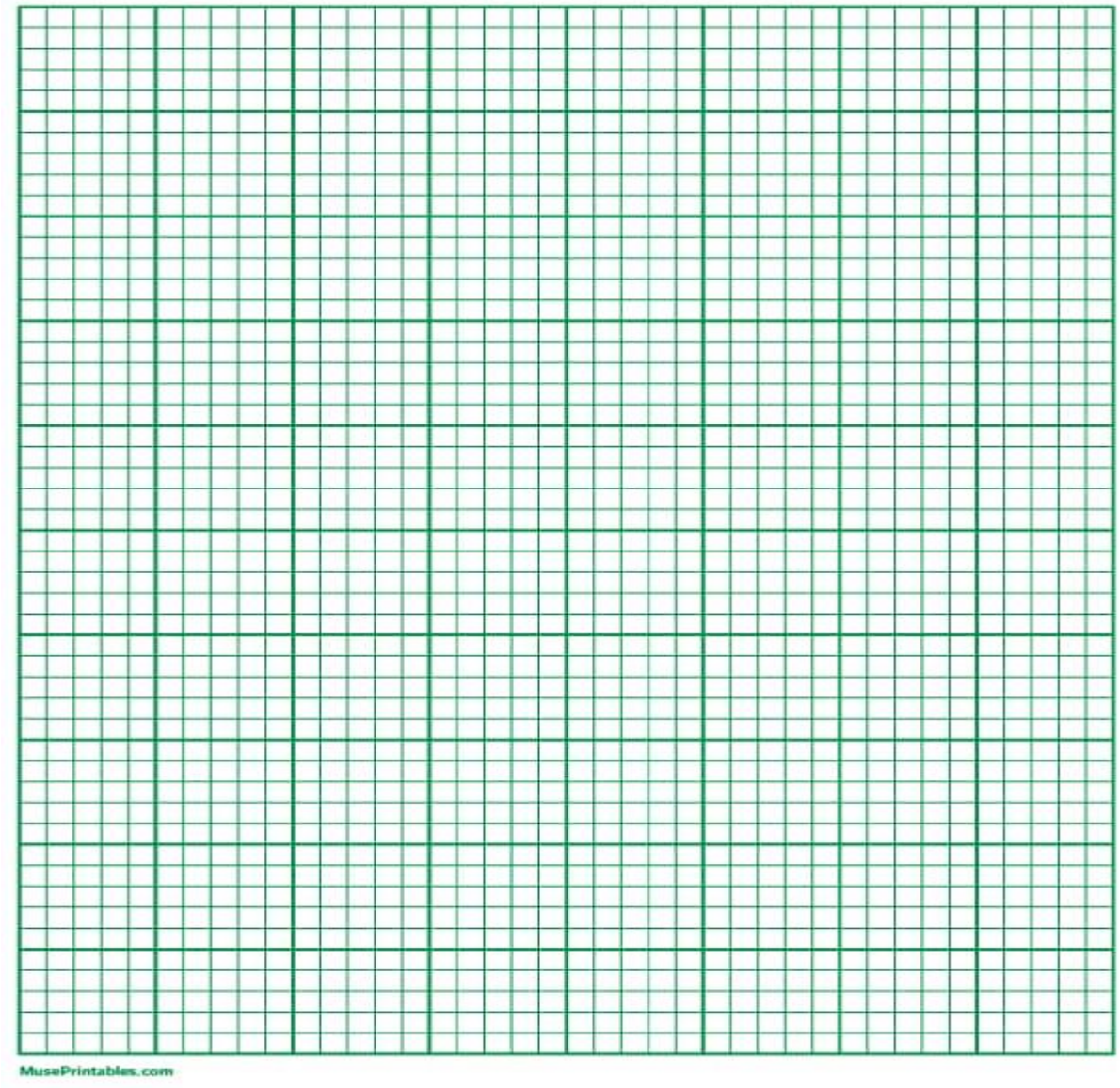
a) $V = kt$

T	1	2		5	6	7	8
V						14	

b) $T = 3s + 7$

S	5	7	8	9	11
T	22				

3.Draw a graph of $y = 3x - 5$ for values of x from -5 to 30 .Take 1cm to 5units for each value of x and 1cm to 10 units for the values of y



Use your graph to find;

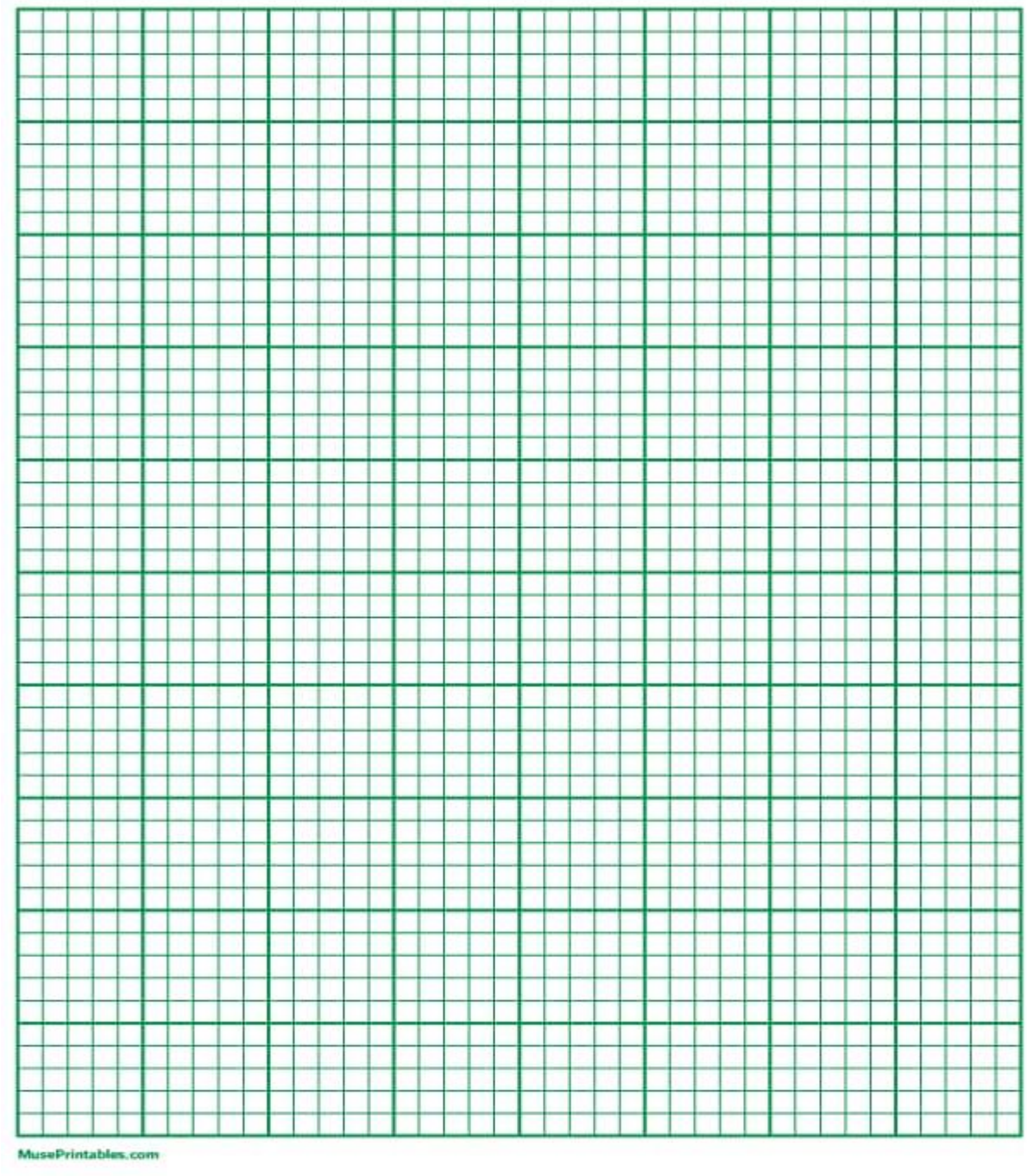
a)the value of y when x is 18

b)the value of x when y is 34

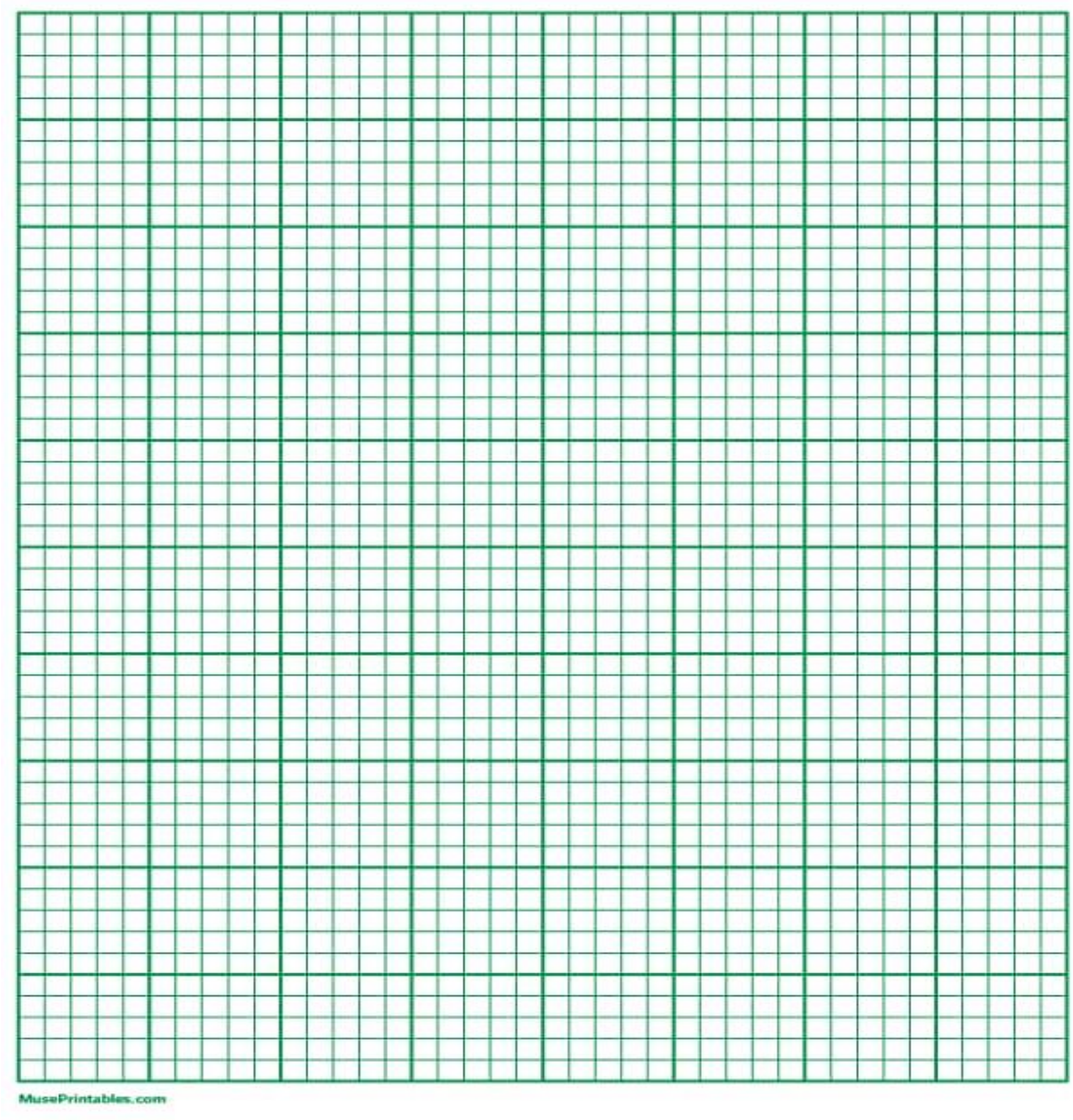
4.The table below shows the distance in meters covered by Magara in moving from town *A* to town *B* .

Distance(m)	0	50	100	150	150	150	200	250	300
Time(s)	0	10	20	30	40	50	60	70	80

a)Draw a distance time graph using the table above.
b)Use your graph to determine;
(i) the distance between the two towns A and B.
(ii)the distance when the time was 15seconds.
(iii)the time when the distance 220m.
(iv)the speed when the time was 45seconds.


MusePrintables.com

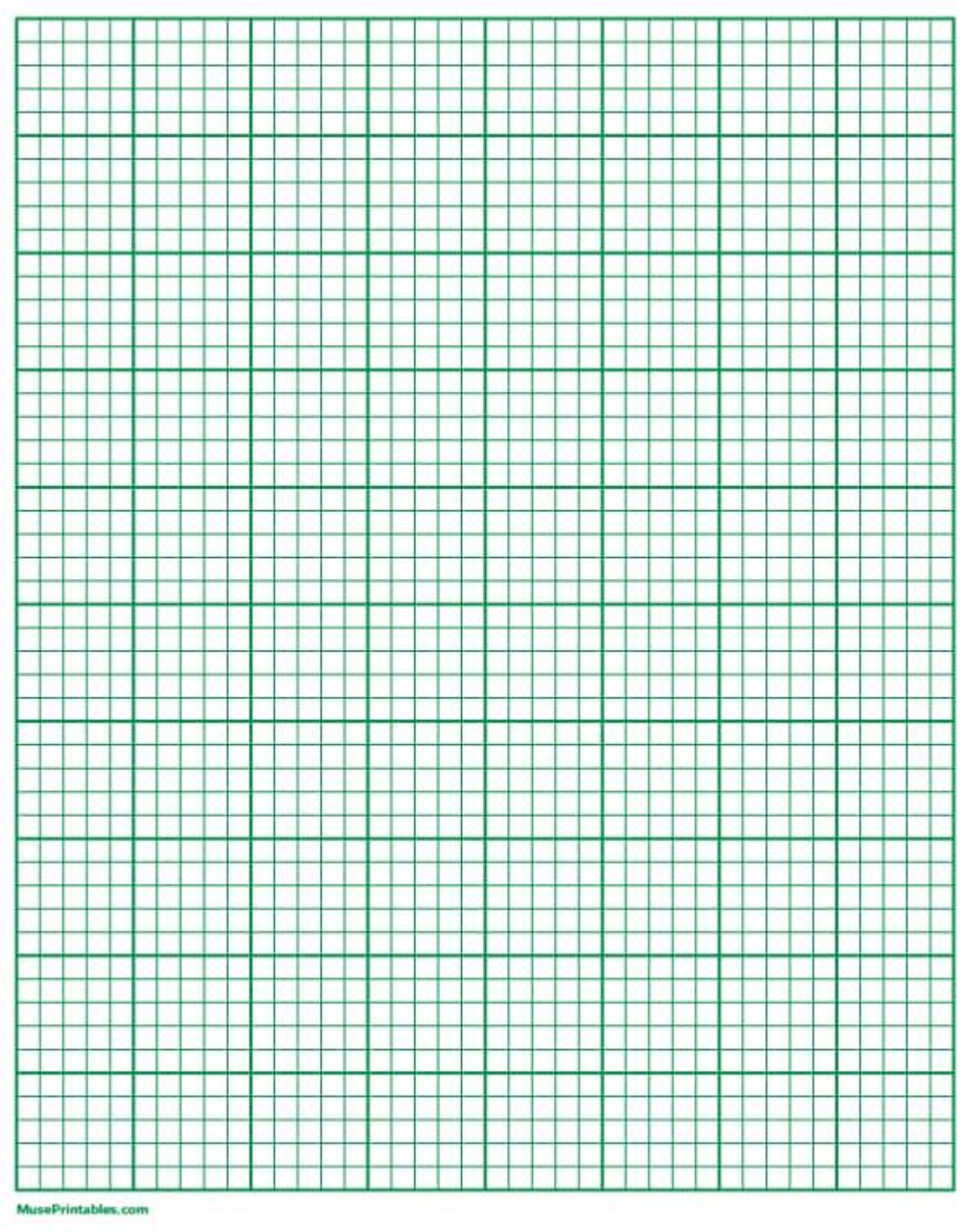
5.Mr Itabaza drives his car between two towns at an average speed of 175km/hr. for 5hours
a)Draw a distance time graph to illustrate this motion.
b)From your graph determine; (i)the distance travelled in 1hr 30 minutes.
(ii)the time taken to cover 215km



Sample Activity of Integration

Mabira is about $120\,km$ from Kampala. A coaster left Kampala at $9:30\,am$ but because f jam it moved at a speed of $10\,kmh^{-1}$ for the first $1hr$. It then covered the next $90\,km$ in $1\frac{1}{4}$ hours before developing a mechanical problem which was rectified in 15 minutes. The coaster set off again and arrived in Mabira at $12:30\,pm$.

a) Draw a table representing time and distance of the coaster.
b) Using a suitable draw a distance time graph showing the motion of the coaster.
c)Find the speed of the coaster:
(i)Before getting a mechanical problem.
(ii)After rectifying the mechanical problem.
d) Calculate the average speed of the coaster for the whole journey.


MusePrintables.com

INDICES

An index is the power to which a given number is raised.

ASSIGNMENT4

1.Prime factorize the following

a) 100

b) 32

c) 125

d)72

2)Evaluate the following

a) $27^{\frac{1}{3}}$

b) $16^{\frac{3}{4}}$

c) $32^{\frac{2}{5}}$

d) $125^{\frac{2}{3}}$

3.Evaluate the following.

i) $\frac{2^8 \times 3^{10}}{36}$

(ii) $\frac{9^{-2} \times 3^3}{27}$

(iii) $(343)^{\frac{2}{3}}$

(iv) $\left(\frac{27}{64}\right)^{\frac{-3}{4}}$

v) $\frac{2^{x+1} \times 2^{-2x}}{2^{-x}}$

vi) $27^{\frac{2}{3}} + 81^{\frac{1}{4}}$

vii) $\frac{12^{\frac{3}{2}} \times 16^{\frac{1}{8}}}{27^{\frac{1}{6}} \times 18^{\frac{1}{2}}}$

viii) $\frac{3^3 \times 9^2 \times 125^{\frac{1}{3}}}{9^3}$

ix) $\frac{4 \times 27 \times 2^{10}}{12^{2}}$

4a) Solve for x in the following equation

(i) $5^{x+1} = 125$

(ii) $3^{2x-1} = 27^{5}$

(iii) $2^{x} = 64$

(iv) $3^{2x+1} = \frac{1}{27}$

v) $16^{x+1} = 8^{x-2}$

(vi) $8^{x} \times 2^{(x+2)} = 4^{(x+3)}$

vii) $\left(\frac{1}{8}\right)^{2x-3} = (16)^{x-1}$

(viii) $27^{2x-5} = \frac{1}{\sqrt{9^{x+1}}}$

ix) $4^{x-1} = \frac{1}{256}$

x) $27^{x} \times \frac{1}{3} = 243$

xi) $3^{4x-1} = 27^{-x-5}$

(xii) $3^{x} + 1 = 82$

5.Given that $2^x = 5$ and $2^y = 3$, find the value of 2^{2x+y}

b)Express $6^{3.5}$in the form $P\sqrt{6}$. hence state the value of P

6.In a sequence the nth term is given by 2^n. Find the value of n if the nth term is 512.

7.Given that $\frac{2^{x+3}-2\times2^x}{5\times2^{x+1}} = \frac{A}{B}$, find the value of A and B in their simplest form.

8)Solve for the unknown:

(a) $3^{2x+1} \times 2^{2p-8} = 648$

(b) $7^{4x-1} \times 8^{3k-1} = 21952$

(c) $2^{x+1} \times 3^{4k-1} = 108$

(d) $3^{x+1} \times 2^{2k-3} = 576$

9. Without using a calculator or tables simplify:

$(0.04)^{\frac{-1}{2}} - 8(4^{-1})(16)^{\frac{3}{4}}$

10.Solve for x in the following equations:

(i) $5^{8x} - 5^{x-7} = 0$

(ii) $3^{x^3} - 3^{64} = 0$

11.Evaluate without a calculator:

(i) $\dfrac{2^{x+2} - 2^{x-2}}{6(2^{x+2})}$

(ii) $\dfrac{3^{x+1} + 3^x}{3^{x+2}}$

12.Without using calculators evaluate the following:

$i)\dfrac{8^{\frac{1}{3}} + 64^{\frac{2}{3}} - 27^{\frac{1}{3}}}{81^{\frac{3}{4}} + \left(\frac{1}{27}\right)^{-\frac{1}{3}}}$

$ii)\left(\dfrac{16}{81}\right)^{-\frac{1}{4}} + \left(\dfrac{36}{64}\right)^{\frac{3}{2}}$

Sample Activity of Integration.

Some 8 members of a certain family joined Quest Net which is a networking business. They each supposed to reach as many clients as possible. Each member was tasked to reach out to 8 clients and each client has to reach out to 8 other clients in 1 month.
As a senior two student and using your knowledge of indices, approximate the number of members in the 2nd month if all members managed to get the required number of clients.

END